

# Space News Roundup

Vol. 22 No. 9

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National Aeronautics and Space Administration

## Bound for the high skies



Crews ready a large balloon for launch last week from the National Scientific Balloon Facility in Palestine, Texas. Above, the balloon is steadied as it is being filled with helium while the payload is cradled in launch position in the background. Below, the balloon and payload, sponsored by the University College of London, head for the stratosphere.

### Scientists seek understanding of stratosphere and ozone

Uncooperative winds high in the sky above Palestine, Texas delayed the largest mass balloon launch ever last week, but crews at the National Scientific Balloon Facility were able to launch another payload for a British university.

When weather permits, scientists plan to release four giant balloons into the stratosphere carrying 17 scientific instruments from Canada, Europe, Japan and the United States as part of the Balloon Intercomparison Campaign (BIC).

The goal is to provide continuing research of the stratosphere and its critical gas ozone, a component vital to life on Earth. The effort also includes an attempt to relate the findings of several different types of instruments and correlate the data on a scale seldom tried before.

Appropriately, the impending multiple balloon launch is taking place during the 200th anniversary year of manned flight, which began in 1783 when two Frenchmen inaugurated lighter-than-air flight with a hot air balloon.

The balloons in the BIC are many times larger; however, they contain the same volume as 200 Goodyear blimps and can carry payloads weighing more than two tons.

The Balloon Intercomparison Campaign is focusing on ozone, as well as two dozen other chemical species that figure in catalytic cycles that could be depleting ozone in the stratosphere.

Ozone became a household concern in the early 1970s when scientists learned that some of society's activities could be destroying the gas and, with it, the protective shield it creates between us and the Sun's ultraviolet radiation.

In the stratosphere, some 12-50 kilometers above the Earth's surface, relatively high concentrations of ozone absorb solar ultraviolet radiation, which can break down molecules and thus harm life.

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## TDRS correction firings begin

With two test firings of the thrusters on the first Tracking and Data Relay Satellite (TDRS-A) successfully behind them, the recovery teams working on the errant spacecraft have begun a second phase of burns designed to loft TDRS-A into a higher orbit and eventually send it to the planned geosynchronous position in about five weeks.

At **Roundup** press time, apogee burns about every 18 hours were to have begun earlier this week in which the spacecraft's orbit will be refined to 22,000 x 18,000 statute miles. This will require about 23 hours of burn time, or about a 20-day effort, according to TDRS Program Manager Robert Aller.

The third phase of TDRS-A correction will be a 17-hour series of burns designed to circularize the orbit at the present 22,000 statute mile apogee. At that point, ground controllers will refine to the desired 22,300 mile geosynchronous orbit.

Controllers are first shooting for

a raised perigee of 17 to 18,000 miles to allow the sensors aboard TDRS-A to go into a Sun-Earth inertial mode. At the higher altitudes, the spacecraft's Earth sensor will be able to properly lock on the Earth and use it for reference, something which is not possible now because the Earth looks too large to the sensors in the lower orbit. TDRS-A is now using the Sun for its reference.

The two firings were about 40 minutes each, with the longest being 43 minutes. Technicians had planned longer burns in each case, but during the first firing a roll thruster developed high temperatures and the burn was curtailed 18.5 minutes early. During the second thruster firing May 5, a 43-minute burn was completed before a yaw thruster also developed a higher than desirable temperature. During the second firing, temperatures in the first roll

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## Storms on Saturn thought to be huge

Those unusual radio signals relayed from Saturn by both Voyager spacecraft in 1980 and 1981 are now thought to be the result of a massive thunderstorm on the sixth planet from the Sun.

Scientists at the Goddard Space Flight Center say the signals indicate a thunderstorm region on Saturn spreading 40,000 miles across the equator with winds clocked by the Voyagers at 1,000 miles per hour.

The scientists, M. L. Kaiser, J. E. P. Connerney and M. D. Desch, in an article for the British journal "Nature," say they base their conclusions on a very unusual type of signal detected by the Planetary Radio Astronomy instrument aboard both Voyagers. The signals, much like static received on a car radio when a thunderstorm is nearby, persisted for several hours, then vanished for three hours only to return and repeat the pattern many times.

Although the resemblance to thunderstorm static was recognized at the time, initial analysis of the data concluded that the strange signals were from an exotic object undergoing electrical discharging in the middle of Saturn's ring system. The waxing and waning of the signals was thought to be related to the object revolving around the planet.

Thick haze overlying much of Saturn inhibits direct observation of features in the cloud tops, and there is thus no reason to think images taken by the Voyagers will reveal the storm. Moreover, portions of Saturn's equatorial zone remain cloaked in darkness for years at a time because they are beneath the enormous shadow cast by the ring system.

There is hope, however, that the same radio static detected by the Voyager probes can be picked up by large ground-based radio tele-

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## Gamma rays from object exceed Sol

An object in the Milky Way galaxy that is emitting high-energy gamma radiation 50,000 times as great as the total power output of the Sun, has been identified by scientists at the Jet Propulsion Laboratory.

Dr. Allan S. Jacobson told the American Physical Society's annual meeting in Baltimore that radiation from the object, called SS 433, appears to come from the isotope magnesium 24. Observations at lower energies by other scientists have indicated SS 433's behavior is unlike any other in our galaxy. "The new observations make a unique object even more bizarre," Jacobson said.

Jacobson says data gathered by the High Energy Astronomy Observatory (HEAO-3) show that the radiations occur at two different energies — one at 1.5 million electron volts and a second at 1.2 million electron volts. Jacobson and his colleagues believe that data

are consistent with a single energy of 1.369 million electron volts.

Two jets of material appear to stream from SS 433, the scientists say, one toward Earth and the other away. Because of their different velocities relative to Earth, radiation from the receding jet shifts toward the lower energies and the radiation from the approaching jet shifts toward higher energies.

According to Dr. Richard Lamb, who led the analysis, the precise energies associated with each radiation shift by a few percent over several weeks as the jets change their orientation in space relative to Earth.

The physicists say the material appears to be moving at 26 percent of the speed of light (light moves at 186,200 miles a second), and — if it is indeed magnesium 24 — it must have undergone extensive nuclear processing. (Nuclear processing

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## Space News Briefs

### Enterprise going to Paris

The Space Shuttle test Orbiter *Enterprise* will be the main attraction of the U.S. display at the Paris Air Show in late May and early June, according to NASA Administrator James M. Beggs. *Enterprise* will be flown to Le Bourget Airport near Paris atop NASA 905, the modified Boeing 747 Shuttle Carrier Aircraft. *Enterprise* will also be displayed at Bonn, London and Ottawa during the tour. Also on hand as part of the NASA display will be the Quiet Short Haul Research Aircraft, testbed of a NASA program for the development of improved lift and propulsive characteristics for future transports.

### NOAA-E stabilized by recovery team

NOAA-E, an environmental monitoring satellite for the National Oceanic and Atmospheric Administration, has been stabilized and is now undergoing activation and evaluation. Launched March 28 from Vandenberg Air Force Base on an Atlas E launch vehicle, the 3,775-pound satellite was lofted into a near perfect 450 nautical mile orbit. Shortly thereafter it began to spin, however, making one revolution every 17 minutes rather than being stabilized with its antennas and sensors pointed toward Earth. The Goddard Space Flight Center formed a recovery team, which developed plans and simulated them on ground computers before signalling corrective measures to NOAA-E on its 302nd orbit. By its 303rd orbit, the spacecraft was completely stabilized. There are six environmental sensors aboard the satellite, as well as the U.S. contribution to an international search and rescue effort. The Search and Rescue Satellite-Aided Tracking, or SRSAT, system aboard will enable the satellite to monitor signals from the transponders of ships and aircraft in distress, pinpoint the position and communicate that information to rescuers on the ground.

### STS-8 payload decision pending

A final decision on the STS-8 cargo will not be made until the joint U.S. Air Force and NASA Anomaly Investigation Board has completed its finding on the Inertial Upper Stage anomaly during STS-6. Headquarters announced last week. In the event the Board's findings and any necessary corrective actions are not finalized before STS-8 manifest decisions are due, the most likely replacement payload on the flight is the Payload Deployment and Retrieval System Test Article, currently slated for STS-11. The Indian National Satellite, INSAT-1, an Indian Government communications satellite, will be launched on STS-8 as originally planned, the announcement said.

### Comet makes close Earth approach

It was first sighted by IRAS — the Infrared Astronomical Satellite just a few weeks ago — and was visible all last week during a very swift close approach to Earth. The object was Comet IRAS-Araki-Alcock, named for the satellite and two amateur astronomers who were the first on Earth to sight the speeding celestial body. In cosmic terms, the comet made a very close approach to Earth on Wednesday — on the order of 3 million miles — before swinging around on its elliptical orbit back toward the distant edges of the solar system. Roughly calculated, the comet's speed was 100,000 miles per hour, or about 132,000 feet per second (that translates to something like Mach 118 at sea level). So fast was its passage, reported JSC amateur astronomer Paul Maley, that it skirted across 40 degrees of the sky in one day, from the constellation Ursa Major to Canis Major.

## Bulletin Board

### Shuttle technical conference planned

JSC will sponsor a technical conference June 28 to 30 designed to assess the progress made thus far in the Space Shuttle Program. Sessions will be held in areas which include avionics, propulsion and power, ground operations, life support, guidance, navigation and control, mechanical systems, communications and tracking, structures and aerodynamics. The conference theme is "The Space Shuttle Program: From Challenge to Achievement." General Chairman for the conference is Aaron Cohen, Director of Research and Engineering. The conference begins at 8 a.m. June 28 with registration, followed by a welcome at 9 a.m. by Director Gerald Griffin and a keynote speech by Lt. Gen. James A. Abrahamson, Associate Administrator for Space Flight. Parallel technical sessions will run through June 28, 29 and 30.

### Blood pressure screening postponed

May is National Blood Pressure Month and the JSC Clinic has always participated in the effort, but with the crush of events surrounding the upcoming June flight of STS-7, the clinic has decided to postpone regular blood pressure screening for a few weeks. A new screening schedule will be announced after the flight.

### 'Night at the Opera' set

The Clear Lake Symphony at the University of Houston/Clear Lake City will present "A Night at the Opera" beginning at 8 p.m. May 21 in the UH/CLC Auditorium. The program will include music by Bizet, Wagner, Verdi and Berlioz, and arias from Handel, Mozart, Donizetti and Puccini. Guest artists are soprano April Pels and mezzo-soprano Judy Hurt. Tickets are \$3 general admission and \$1 for students and senior citizens. For further information, contact the Symphony office at 488-9390 or 488-9288.

### AIAA Astronaut Rendezvous scheduled

The Houston Section of the American Institute of Aeronautics and Astronautics is sponsoring an Astronaut Rendezvous, a tribute to past flight crews, beginning at 7 p.m. May 20 in the Bldg. 2 Auditorium. Representatives of flight crews from the Mercury, Gemini, Apollo, Skylab, Apollo-Soyuz and Shuttle programs will be on hand, according to AIAA president Sharon Barnes Castle. The program will include a welcome and introductions, a recognition of Honorary Fellows and Fellows, a presentation of the 1982-83 Houston Section individual awards, recollections by representatives of the different space flight programs, and an introduction of future flight crews. The evening begins with a champagne reception at 7 p.m. and the program begins at 8 p.m. Tickets are \$10 each and may be purchased from the following persons on site: Richard Davidson, x5545; Carolyn Conley, x3486; Norman Chaffee, x3995; Bob Lewis, x3566; Ron Berry, x3301; and Bob Cohen, x6161.



Astronaut Robert L. Stewart, a mission specialist assigned to STS-11, backs into a Manned Maneuvering Unit during simulations in the Weightless Environment Training Facility recently. The MMU is scheduled to be flown for the first time on STS-11 next year.

## TDRS-A firings

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thruster were acceptable, an indication that technicians understand the thermal problem and that corrections can be worked out. They hope to initiate a series of one hour burns during the actual correction phases underway.

In both cases, the thrusters were operating correctly as commanded by on-board equipment. However, the firing rate of both thrusters was such that high temperatures developed. Cooling of the thrusters comes from the hydrazine fuel, thus the fewer times the thrusters are fired the greater the chance of

higher temperatures.

Program officials believe the entire series of thruster firings over the next month or so will consume about 800 pounds of hydrazine, leaving an ample amount for attitude control of the TDRS-A over its 10 year lifetime.

## Gamma rays

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takes place in the interior of stars, and synthesizes elements from the original hydrogen and helium.)

The source of the material causing the radiation, they say, could

be a neutron star buried within SS 433. A neutron star is a star with about the same mass as the Sun that has collapsed to a diameter of only a few miles.

Another, more exotic, possibility is that SS 433 contains a black hole.

The scientists believe the neutron star or black hole in SS 433, which is 15,000 light years from Earth, must have formed within the last 1,000 to 10,000 years, and that

the jets pouring from it are punching holes in the interstellar medium around it.

SS 433, while in the Milky Way galaxy, appears to be undergoing processes on a relatively small scale that occur on a large scale in quasars and active galaxies, scientists say.

The HEAO-3 satellite was launched by NASA in 1979 to observe the sky in high-energy-radiation ranges.

## Saturn storm

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scopes, and such an effort has begun in New Mexico, France and Chile.

With this discovery, Saturn becomes the fourth planet in the solar system to exhibit some aspects of thunderstorms, joining Earth, Venus and Jupiter. None of the storms observed on any of the three planets can rival that on Saturn in size, however.

The Voyager radio astronomy research team estimated that the total power radiated in the radio noise pulses from the lightning storm exceeds 1 billion watts, equal to the power generated by a nuclear power plant.

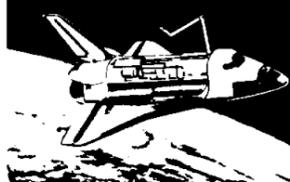
NASA  
Lyndon B. Johnson Space Center

## Space News Roundup

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Editor

Brian Welch



## Perspective

# Requiem for a robot

*For Viking, it looks as if the mission is finally over*

Last week, controllers at the Jet Propulsion Laboratory tried unsuccessfully to communicate with the Viking 1 Lander on Mars, and it now appears that the mission is over. There is one more opportunity to contact the Lander on May 20. If those commands do not succeed, all possibilities for fixing the probable failures will have been exhausted. In the following article we look back at the Vikings and the lore of Mars in an attempt to pay homage to one of America's most successful space probes.

Both the Babylonians and the Romans, centuries apart, observed its progress across the sky and named the point of light after their respective gods of war. The Roman name stuck, and for better than 2,000 years Mars has been of particular interest to those curious among us who watch the stars.

Mars became the springboard for legends of bug-eyed monsters (the ubiquitous BEMs of science fiction) and for an assortment of characters ranging from John Carter, the human "Prince of Mars," who hacked and slashed his way across most of Tharsis, to the Martians in their terrible machines of destruction who repaid his attentions by frying Los Angeles in a war of the worlds.

From fact to fiction, Mars developed a cult standing of sorts among the planets. In past ages, there was a fairly widely held belief that all of the celestial bodies out there housed life — usually intelligent and often malevolent — and great authors such as Voltaire and Jonathan Swift wrote of the adventures to be found on the shores of other worlds. Of all the planets, however, Mars tended to dominate.

"It is a planet which has special connotations," author James Michener said during a NASA-sponsored colloquium in 1976. "I cannot recall anyone ever having been as interested in Jupiter or Saturn or Pluto. Mars has played a special role in our lives, because of the literary and philosophical speculations that have centered upon it."

Henry S. F. Cooper, in his book *The Search for Life on Mars*, traces some of those special connotations to the Italian astronomer Giovanni Schiaparelli, whose observations in the 1870s of faint lines on the Martian surface — channels, or *canali* in Italian — through misinterpretation in the English speaking world fostered the belief that a race of super engineers on Mars constructed canals to irrigate their desiccated world.

Over the next two decades, this influenced the American astronomer Percival Lowell, and his influence in turn was widespread. "After his death," Cooper writes, "planetology went out of fashion, partly because of the claims he had made, but when it became fashionable again, with the advent of the space program in the late 1950s, Lowell's ideas had to be reckoned with once more. Though only a handful of scientists still believed in the canals, a great many still believed that Mars, with its misty Elysiums, might be covered with vegetation."

In our own times, with newer and better technologies telling us that life out in the solar system just does not exist, Mars has remained a resilient last chance for the forces of exobiology. As late as the 1970s, when the notion of green-skinned, bug-eyed natives romping about in the shadow of Olympus Mons had passed from serious discussion, we were willing to settle for hardy lichens or even sturdy microbes, and indeed the possibilities were there.



Viking 2 captured this striking view of Mars during its approach in August, 1976. Bright plumes of water ice clouds stream a considerable distance northwestward from the western flank of Ascreaus Mons, one of the three major volcanoes aligned on the Tharsis bulge of Mars. Below, another of those Tharsis volcanoes, Arsia Mons, is shown in a three-dimensional perspective generated by computer with the help of Viking image, contour and terrain data. The view is from the southwest, 25 degrees above the horizon. Arsia Mons rises 15 kilometers above the surrounding plain with a cone 400 kilometers in diameter.



Based in part on that hope, and as much or more on the somewhat more prosaic desire simply to explore another planet, the United States sent a series of probes to Mars beginning in 1964 with Mariner 4, continuing with the Mariner 6, 7 and 9 spacecraft from 1969 to 1972, and culminating in the Viking probes in the mid-1970s.

Viking 1 was launched August 20, 1975, and Viking 2 followed on September 9. Each consisted of an orbiter and a lander, sterilized before launch to avoid contami-

nating either Mars or their own biological experiments. Viking 1 arrived at Mars June 19, 1976, and the Viking 1 Lander touched down on July 20, exactly seven years after Apollo 11 reached the Moon. The site was at 22.3 degrees north latitude and 48 degrees west longitude on the western slope of Chryse Planitia, the Plains of Gold.

Viking Lander 2 arrived at Mars on August 7 and touched down on September 3 at 47.7 degrees north latitude and 225.8 degrees west longitude at Utopia Planitia, the

Utopian Plains.

These orbiters and landers were the most sophisticated planetary explorers ever developed at the time of their launch, and in some respects they even surpassed the capabilities of our champion deep space explorers, the Voyagers (which was the original name of the Mars project).

Up to last November 13, they operated far beyond their design lifetimes with few failures. Viking Orbiter 1 exceeded four years of

active flight operations in Mars orbit; Lander 1 operated on the surface for almost six and one-half years. Viking Orbiter 2 was the first craft to end its mission, in July 1978, when the last of its control fuel was used up. It had operated for 718 days in orbit. Viking Orbiter 1 lasted until August 7, 1980, being shut down for the same reason as its counterpart after 1,509 days of operations. The last data from Viking Lander 2 reached Earth in April, 1980 after 1,316 days of operations.

Lander 1 was to have been the last outpost. It had power, it seemed to have awesome durability and it was content to contact Earth every week or so with weather reports and a picture of the surface. It had entered its "extended mission," what some dubbed the "eternal mission," and it was programmed to operate through 1994.

Then on November 13, after six years and 108 Earth days of mostly trouble-free operations, a catastrophic failure occurred. Whether this failure happened in the batteries or the computer system or in a cable to the communications antenna, no one is quite sure. After sending more than 2 million weather reports and taking a majority of the 4,500 images returned by both landers, the last Viking appears finally to have signed off.

What we learned in the last six years about Mars is profound. We mapped 97 percent of the surface with a resolution of 300 meters or better, and 25 percent of the surface with a resolution of 25 meters or better. We saw fog in Martian valleys, wispy clouds streaming out from the tallest mountain in the solar system and frost on the ground. We saw evidence of massive floods and erosion caused by water, and we saw dust storms envelop the planet.

We observed that the planet is dryer than any spot on Earth, and that the weather is both uniform and dull. The wintertime low was about  $-191^{\circ}\text{F}$ , while the summertime high was a stark  $-24^{\circ}\text{F}$ . We clocked fairly placid winds, measuring no gusts above 74 miles per hour. We discovered that the Martian atmosphere, mostly carbon dioxide, contains some nitrogen, and we found that Martian soil is chemically very reactive.

The most important search for many of us was that for life, and here the results were more ambiguous, and were debated for several years. The general consensus from the biology experiments pointed to a dead planet. According to some Viking biologists, however, the question is still open. Three of the results indicated the absence of biology in the samples tested. But one result indicated the Martian soil has either an agent capable of rapidly decomposing organic chemicals or that life is present. The soil did not, however, contain any organic molecules that were detectable at the parts-per-billion level.

"In contrast to a few years ago, the interest among scientists today in the proposition that there might be life on Mars is virtually nil," Cooper writes. "In evolutionary terms, the idea that life currently exists on Mars has quietly gone the way of the Great Auk. If there is no life on the one planet in the solar system which, next to Earth, had long been considered the most likely to foster it, then the search will have to shift where neither we nor our machines can easily follow."

For Viking Lander 1, that search now appears to be over, and for the first time since 1975, the clicking and whirring has ceased, and a stillness has once again descended on the rocky Plains of Gold.

—Brian Welch

## Gilruth Center News

Call x3594 for more information

**Garage sale** — Come swap and shop at our annual garage sale from 9 a.m. to 3 p.m. May 21. All types of homemade items will be on sale, a concession stand will be open and a limited number of tables are still available. Reservations must be made in advance by calling x3594.

**Children's movie** — The next movie will be a Road Runner cartoon festival and will include popcorn and drinks. The cost is \$1 per person and tickets are available at the Bldg. 11 Exchange Store. Call the Rec Center for details.

**Softball tourney** — Registration is now being accepted for a men and women's "B" league tourney to be held May 21 and 22. The cost is \$65 per team and the tourney is limited to 24 male and female teams.

**Race** — Sign up now for our 8 kilometer or 1 mile race to be held May 21 beginning at 8 a.m. The cost is \$1 per person and registration is underway.

**Defensive driving** — Learn to drive safely and qualify for a 10% reduction in your auto insurance rates for the next three years. The class meets from 8 a.m. to 5 p.m. May 21. The cost is \$20 per person and space is limited.

**Suzuki lessons** — Introduce yourself to the joy of music. You will learn the basics of playing the piano. The Suzuki method will be offered from 5 to 6 p.m. Wednesdays beginning May 23. The four sessions cost \$54 per person and times can be arranged with the instructor.

**Exercise** — Come stretch with the gang for only \$12 per person at the Rec Center. The class is now open for males and females. Call the Rec Center for details.

# Balloon studies

(Continued from page 1)

Anything that may deplete ozone — such as aircraft and fertilizer emissions, and the chlorofluorocarbons (CFCs) used as refrigerants and as propellants in some aerosol cans — therefore is a potential problem for life on Earth's surface. Moreover, any altering of the vertical distribution of ozone may lead to undesirable changes in climate. It is not simply ozone levels (how much) but also the distribution (where it is) that concerns scientists.

Potential long-term ozone depletion estimates have been scaled down — from early estimates of 15-18 percent to more recent calculations of 3-5 percent as assessed by the United Nations Environmental Program (UNEP) Coordinating Committee on the Ozone Layer (CCOL) in Geneva, Switzerland, April 1983. It is still important to understand how the atmosphere is being perturbed. For example, some computer models predict a

decrease in ozone in the upper stratosphere and an increase in the lower stratosphere. These may cancel in terms of ultraviolet exposure, but redistribution of stratospheric ozone may have as-yet-untold climatic effects.

Researchers have been aware of the potential hazards of ozone depletion for some time. Governments and industry have responded to the global nature of the problem. The United States has restricted emissions of CFCs; the European Economic Community is considering legislation requiring a 30 percent cutback in CFC production. During April an ad hoc working group of legal and technical experts met to discuss a global framework for the protection of the ozone layer. Twenty six governments were represented showing the very high level of international interest in this subject.

In light of the economic impacts of the ozone problem, atmospheric scientists are now under pressure

to come up with more realistic and accurate assessments of the situation, and this is exactly what Balloon Intercomparison Campaign organizers hope to do.

The program has two requirements. First, BIC organizers hope to assess the accuracy of scientific instruments currently used to study the composition of the stratosphere. Second, they aim to provide the most comprehensive and thoroughly tested set of data yet available on the chemistry of the ozone layer with which to test the theoretical models.

Among the instruments aboard the payload gondolas is an ozone probe provided by JSC's Planetary and Earth Sciences Division

Experiment gondolas for phase two have been provided by the National Physical Laboratory, Oxford, England; the University of Leige, Belgium; and the Jet Propulsion Laboratory, which operates an extensive balloon studies program.

## Roundup Swap Shop

Ads must be under 20 words total per person, double spaced, and typed or printed. Deadline for submitting or cancelling ads is 5 p.m. the first Wednesday after publication. Send ads to AP 3 Roundup, or deliver them to the Newsroom, Building 2 annex. No phone-in ads will be taken. Swap Shop is open to JSC federal and on-site contractor employees for non-commercial personal ads.

### Property & Rentals

For lease: Clear Lake City 1 BR condo, 1 block from the bus stop, great location, no pets. Call 488-0621 after 5 p.m.

For lease/rent: Sagemont 4-2-2, large den, fenced, close to schools, 12 miles from NASA, \$525/mo. plus deposit. Call 331-1136.

For lease: Baywind 1 condo, 2-2-2, first floor, immediate occupancy, \$450/mo. plus deposit. Call 332-4759.

For lease: Eldorado Way 1 BR condo, FP, W/D, covered parking, burglar/smoke alarms, tennis, exercise/sauna room. Call Jim Briley, x 2831 or 488-7901 after 5 p.m.

For sale: Freeway Manor house, 3-1-1, excellent investment or starter house, carpeted, large fenced yard, trees, quiet, low 40s. Call Leonard, x4204 or 944-4997 evenings.

For sale: Heritage Park 3-2-2, extra large fenced corner lot, rose and vegetable gardens, fruit trees, vaulted ceiling, by owner, \$61,900. Call 554-6241.

For sale: League City/Newport 3-2-2, formals, trees, close to pool, possible owner finance. Call 554-2790.

For rent: Galveston ocean front condo, 1 BR completely equipped, pool and tennis, reserve now for spring/summer vacation, introductory rates. Call Nussman, 721-2459.

For sale: condo near JSC, available end of June, 2-2.5, all appliances. Call owner, 333-4379.

For sale: Webster/Piper's Meadow 2-2-2, large fenced lot at cul-de-sac, fireplace, FHA assumable, low equity, many extras. Call Nina, x3551 or 480-6720 evenings.

For sale: La Porte 3-1.5-1, 4 yrs. old, \$58,900. Call 471-1472 after 5 p.m.

For sale: Crystal Beach/Bolivar beach house, income/pleasure, furnished, Gulf view, \$33,500. Call Wilson, x5326 or 333-3886.

For lease: 10 acres in Alvin area, fenced, on paved road, horses, cattle. Call L. Damewood, 482-5572.

For lease: Beautiful 2 story townhouse, 2-2.5-2, fireplace, atrium, fenced patio, balcony, garage opener, pool, master bedroom, NASA area, \$590/mo. Call 333-1757.

For rent: Heritage Park 3-2-2, draperies, microwave, cable hookups, clean, friendly neighborhood, near Landolt Elementary, available June 10. Call Gail, x4986.

For rent: Rayburn Country lakefront house, 3 BR, furnished, air conditioned, canoe, sunfish, ski boat available. Call Hayes, x7272 or 488-1446.

For sale or lease: Egret Bay 1 BR condo, fireplace, W/D, mini-blinds, upgraded tile, covered parking and storage. Call 333-2378 days or 333-9385.

### Cars & Trucks

1977 Datsun pickup, good condition, 26 MPG, AM/FM/tape deck, \$2,500. Call 921-7212.

1950 Chevy, 97K actual, restored by third owner, kept in garage, could drive daily, asking \$2,700. Call Smith, x4571 or 471-2419.

1972 Corvette, 350, auto, excellent condition, \$8,000 or best offer. Call 471-5161 after 7 p.m.

1977 Fiat X-19, convertible, air,

AM/FM/cassette, excellent condition, \$3,100. Call 486-8266 or 480-8325.

1967 Chrysler, 440 cu. in.; 1977 Ford LTD, four door. Call 946-4203.

1980 Cutlass Calais, loaded, deisel, 25-34 MPG, extra nice, travel in style, comfort and economy. Must sell. Call Thompson, 332-2229.

1973 Plymouth Satellite, 318-V8, one family car in good condition, 82K miles, \$850. Call Ted, x3314 or 486-4747 after 5 p.m.

1974 VW bug, AM/FM/8-track, runs great, reliable, \$2,100. Call Don, 280-8710 or 729-8176.

1976 TR7, victory edition, 4-speed, sunroof, 48K miles, good condition, no rust. Call Ray, x3551 or 484-3396 after 6 p.m.

1975 Chevy Malibu, 4 dr., 350, AC PS, cruise, looks/runs good, needs some work. Call Joe, x5549 or 481-0069.

1971 Volvo 2 dr. sedan, low miles, AC, runs, \$1,250. Call Phil, x3384 or 488-4453 after 5 p.m.

1970 Mustang, 302 V8, 3 spd., 88K miles, good condition, \$1,250. Call Don x3987 or 534-2053 after 6 p.m.

1968 Mustang convertible, GT/California special, red/black, AC, power top, \$3,500. Call Tim, x2276 or 488-6167 after 5 p.m.

1975 Mercury Marquis, 4 dr. sedan, V-8, auto, AC, AM/FM, PS, PB, power windows, cruise, \$1,000 or best offer. Call 332-2041.

1969 Chrysler New Yorker, body in very good shape, does not run. Family owned since new, \$300. Call Laura, x6181.

1977 Olds 98 Regency coupe, AM/FM stereo, power seats, very clean, runs great, 403 V-8, non-smoker's car, below Bluebook. Call Ken, 488-5660, x412 or 474-3500.

1979 Mercury Capri RS turbo, perfect condition, PS, PB, AC, AM/FM/cassette, new Michelin TRX, garaged, high Bluebook. Call Lambert, x2781 or 554-7079.

### Cycles

1969 Honda 350 (CB), runs but needs some restoration, \$250/best offer. Call Steve, x5111 or 554-2435.

1973 Suzuki, TS250, low miles, very good condition, extras, \$400 or best offer. Call 471-5161 after 7 p.m.

16" Schwinn bike, blue, convert to boy or girl, \$30. Call 488-2735.

1976 Honda M/C, XL175, low miles, blue, helmet included, \$350. Call Smith, x3987.

### Boats & Planes

Bonanza time available at \$35/hr. dry, IFR with DME, HSI and flight director autopilot, 500TT, 100 retrac, 25 Bonanza required. Call Bill Pruett, x4491 or 487-3857 evenings.

Fourth or half interest in IFR Skyhawk based La Porte, modern avionics include DME, HSI and 2 axis autopilot, none finer anywhere for less. Call Pruett, x4491 or 487-3857 evenings.

Long-Eze plans, never used, plus all canard pusher updates, \$150. Call Charles, 480-2896.

FAA pilot ground school, \$10 through Gulf Coast Aero Club, \$8/mo. dues. Call Mark, x4436 or 554-2538.

Piper Lance for rent, six place, 160 knots, full IFR, club seating, \$85/hr. wet. Call L. Damewood, 471-1675.

Victoria Eighteen sailboat, 18', many extras, good condition. Call Tracy, 488-5568 or 482-8426.

10' inflatable rubber boat with wood transom and floorboard, includes 2 life jackets and gas tank. Call Ben, x2314 or 488-1326 after 5 p.m.

### Audiovisual & Computers

Garrard turntable, \$20; Heath tape deck, \$20; Heath AM-FM tuner, \$20. Call J.W. Samouce, x4727.

Realistic portable cassette with built-in stereo speakers, \$35; 8-track player, recorder, \$30; AM/FM stereo, phono, 8-track player, \$50. Call Blacknall, x5378 or 480-2896.

Zenith 23" color TV console, \$250. Call 488-1351 after 5 p.m.

Portable amplified PA system, 2 channel, mic, phono, tape head, heavy duty case, accessories, \$120. Call Samouce, x4727.

Computer terminal and modeem for rent, \$10/wk. or \$35/mo. Call Jim Welton, 482-1461 after 5 p.m.

Intellivision master component, 3 games, poker/blackjack, space battle, space hawk, \$100. Call Rene, x2666 or 944-0948 after 5 p.m.

Pocket computer, Radio Shack PC-2, 8K modules, Basic, built-in scientific, used two months, \$235. Call C.W., x3101 or 643-8944.

Interested in joining pocket computer club at JSC? Share programs, buy new ones. Call C.W., x3101 or 643-8944.

### Household

Maytag washer, \$100; Whirlpool gas dryer, \$200; Sears microwave, \$350. Call 488-1351 after 5 p.m.

Antiques: Chiffrobe, \$275; square oak table, \$135; two bookshelf units, \$125 each; printer drawers, \$25; plus misc. country kitchen items. Call 334-4483.

Kenmore 17 cu. ft. refrigerator, frostless, clean, white, \$225. Call Mariann, x3791 or 486-9268 evenings.

Contemporary brushed chrome coffee table, opens for bar or storage, excellent condition, outstanding value. Call 488-8598 after 5 p.m.

Sears Kenmore 70 gas dryer, \$25; suitcases, \$5 each. Call Blacknall, x5378 or 480-2896.

Eight-piece Italian provincial girl's bedroom suite, first class. Call AI, 486-9220.

Velour swivel rocker, \$50; velour recliner, \$50; stereo, \$150; vinyl rocker, \$20; print sofa, \$50. Call Cox, x4320.

Early American couch, rust, best offer; oval shaped coffee table, best offer. Call Reese, x3754.

Bedroom corner unit with table, \$200. Call 333-3425 after 5 p.m.

1980 Speed Queen heavy duty washer and electric dryer, almond color, used 1 year, \$300 for both. Call 488-5445.

Single bed, box spring, mattress and frame, \$15. Call Lorraine, 488-3720.

Large desk, 30" x 80", custom made, plenty of storage, built-in drawing board, ideal for engineering, drafting, art, hobbies or crafts, \$150. Call Ramsell, x5381.

### Wanted

Wanted for summer: room with kitchen privileges, efficiency or garage apartment for JSC summer intern and wife, furnished or not, NASA area, move-in about June 6th. Call 512-445-

5305 collect after 6 p.m., keep trying.

Need ride from Sunnyside/Southpark area to NASA, 7:30-4 p.m. shift. Call Dee, x2226.

Need housing for summer faculty program starting in June. Call Bob Crow, x4724.

Want to buy or borrow Radio Shack Time Cube. Call Ron, 486-2172 or 489-1059.

Want male roommate to board in 3-2-2 house close to NASA, \$250/mo. Call Jeff, 554-7486 before 10 a.m.

Want to join carpool from southwest Houston for 8 a.m. shift. Call Fay, 280-6482.

Want female roommate for fall '83 and spring '84 semesters at Texas A&M. Call 486-9332 after 5 p.m.

Want S-50 instamatic camera, must be undamaged and in good working order. Call Lloyd Johnson, x6101 or 626-2914 after 5:30 p.m.

Need carpool partners for pool from SW Houston, Fountainview/San Felipe area, hours 7:30-4. Call Betsy, x2016.

Want to form or join carpool from FM 1960/Aldine - Westfield area to NASA, leave home 7 a.m., leave NASA 5 p.m. Call Jan, 280-6514.

Wine enthusiast seeking others to form a tasting group to study and enjoy fine wines from around the world. Call John, x2838.

### Pets

Norwegian Elkhound puppies, 9 weeks, \$100. Call Sandra Smith, x6461.

Nice two-year old male neutered cat, rabies shots, giveaway due to moving. Call 333-4379.

Pedigreed Californian rabbits, with papers, ideal for 4H or FFA projects; also ringnecked doves for \$5/pair. Call 946-7860.

### Miscellaneous

Comfortable, broken-in Royal manual typewriter, factory reconditioned

## Cookin' in the Cafeteria

Week of May 16-20, 1983

**Monday:** Chicken & Rice Soup; Texas Hots & Beans, BBQ Ham Steak, Steak Parmesan, Beef & Macaroni (Special); Green Beans, Carrots, Au Gratin Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday:** Tomato Soup; Potato Baked Chicken, BBQ Spare Ribs, Mexican Dinner (Special); Squash, Broccoli, Ranch Beans, Spanish Rice.

**Wednesday:** Seafood Gumbo; Liver & Onions, Baked Turbot, BBQ Ham Steak, Baked Meatloaf w/Creole Sauce (Special); Beets, Brussels Sprouts, Green Beans.

**Thursday:** Beef & Barley Soup; Chicken & Dumplings, Corned Beef w/Cabbage. Smothered Steak w/Cornbread Dressing (Special); Spinach, Cabbage Cauliflower au Gratin, Parsley Potatoes.

**Friday:** Seafood Gumbo; Pork Chop w/Yam Rosette, Creole Baked Cod, Tuna & Salmon Croquette (Special); Brussels Sprouts, Green Beans, Buttered Corn, Whipped Potatoes.

Week of May 23-27, 1983

**Monday:** Cream of Celery Soup; Braised Beef Ribs, Chicken a la King, Enchiladas w/Chili, Italian Outlet (Special); Navy Beans, Brussels Sprouts, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday:** Beef & Barley Soup; Turkey & Dressing, Country Style Steak, Beef Ravioli, Stuffed Cabbage (Special); Corn Cobbette, Okra & Tomatoes, French Beans.

**Wednesday:** Seafood Gumbo; Catfish w/Hush Puppies, Roast Pork w/Dressing, Chinese Pepper Steak (Special); Broccoli, Macaroni & Cheese, Stewed Tomatoes.

**Thursday:** Cream of Tomato Soup; Beef Tacos, BBQ Ham Slice, Hungarian Goulash, Chicken Fried Steak (Special); Spinach, Pinto Beans, Beets.

**Friday:** Seafood Gumbo; Liver & Onions, Deviled Crabs, Roast Beef w/Dressing, Tuna & Noodle Casserole (Special); Whipped Potatoes, Peas, Cauliflower.